REMARKS

I. Introduction

In response to the pending Office Action, Applicants have amended claims 1 and 6 so as to further distinguish the present invention over the cited prior art references. Support for the amendments to claims 1 and 6 can be found, for example, in the specification on page 13, lines 1-10. No new matter has been added.

For the reasons set forth below, Applicants respectfully submit that the pending claims are patentable over the cited prior art references.

II. Rejection Of Claims 1-10 Under 35 U.S.C. § 103

Claims 1-10 were rejected under 35 U.S.C. § 103 as being unpatentable over USP No. 5,801,101 to Miyoshi in view of USP No. 5,368,685 to Kumihashi. For the reasons set forth below, Applicants respectfully submit that claims 1 and 6, as amended, are patentable over the cited references.

As recited by claims 1 and 6, the present invention relates to a novel method for dry-etching a Cu-containing aluminum film on a substrate, which prevents the generation of copper residue which can cause leakage current between interconnects, without a degradation in the shape of the interconnect. More specifically, as recited by the claims, during the dry-etching of the Cu-containing aluminum film utilizing an etching gas containing at least chlorine, the gas stay time τ (= P • V/Q) is controlled so as to be between 0.15 seconds and 0.30 seconds.

As explained in detail on page 9, line 9 to page 10, line 10, when the gas stay time is controlled to be within the foregoing range, the copper residue is sufficiently reduced such that no current leakage occurs due to copper residue, and the Cu-containing aluminum film is not over-etched. As such, the shape of the interconnect is not degraded. This is due to the ability of the aluminum chloride, which is a reaction product of the aluminum film and the etching gas, to capture copper during etching. Thus, by controlling the stay time of the etching gas as recited by claims 1 and 6, the aluminum chloride can be effectively remove the copper, thereby preventing the generation of copper residue, and the Cu-containing aluminum film is not over-etched.

Turning to the cited prior art references, first, Miyoshi discloses a method of etching a metal wire comprising a first etch step in which the stay time of the etching gas is set so that a deposit is formed on the sidewall of the pattern, and a second etch step in which the stay time of the etching gas is set such that it is less than the stay time of the first etch step. During the second etch step, the deposit formed in the first etch step is removed (*see*, col. 5, line 64 - col. 5, line 41). ***Importantly, however, Miyoshi does not appear to disclose or suggest controlling the stay time of the etch gas to prevent the generation of copper residue.*** Indeed, this is inherently noted in the pending rejection. As it is admitted that Miyoshi does not disclose or suggest the residence time of the etching gas, it is axiomatic that Miyoshi does not disclose controlling the stay time of the gas so as to prevent the generation of copper residue.

Turning to Kumihashi, it is respectfully submitted that this reference fails to cure the deficiencies of Miyoshi. Specifically, as noted in the rejection, Kumihashi discloses

changing the volume of the etching chamber and volume of the discharge/exhaust part to obtain a specific gas residence time. However, as with Miyoshi, Kumihashi does not appear to disclose or suggest controlling the stay time of the etch gas so as to minimize the generation of copper residue. In contrast, claims 1 and 6 have been amended to recite the express stay time that optimizes the elimination of copper residue and that prevents over-etching from occurring.

Thus, as each and every limitation must be disclosed or suggest by the cited prior art references in order to establish a *prima facie* case of obviousness (*see*, M.P.E.P. § 2143.03), and none of the foregoing references disclose the recited stay time of the etch gas, which prevents the generation of copper residue and prevents over-etching, it is clear that claims 1 and 6, and the claims dependent thereon are patentable over the cited prior art references.

Furthermore, it is well known that the fact that the prior art could be modified so as to result in the combination defined by the claims at bar would not have made the modification obvious unless the prior art suggests the desirability of the modification. ***In re Deminski***, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986).

Indeed, recognizing after the fact that such a modification would provide an improvement or advantage, without suggestion thereof by the prior art, rather than dictating a conclusion of obviousness, is an indication of improper application of hindsight considerations. Simplicity and hindsight are not proper criteria for resolving obviousness. ***In re Warner***, 379 F.2d 1011, 154, USPQ 173 (CCPA 1967).

It is only Applicants' disclosure that discloses controlling the stay time of the etch gas so as to prevent the generation of copper residue and to prevent over-etching, None

of the other cited prior art references appear to do so, nor do they even acknowledge the problem solved by the present invention. Thus, the only motivation of record for the proposed modification of the devices of the prior art to arrive at the claimed invention is found in Applicants' disclosure which, of course, may not properly be relied upon to support the ultimate legal conclusion of obviousness under 35 U.S.C. §103. ***Panduit Corp. v. Dennison Mfg. Co.***, 810 F.2d 1561, 227 1 USPQ2d 1593 (Fed. Cir. 1987).

For all of the foregoing reasons, it is respectfully submitted that the pending claims are patentable over the cited prior art of record.

III. Request For Notice Of Allowance

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication for which is respectfully solicited.

If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

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